HP 13047A
User Control Store Kit
installation and service manual

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MANUAL PART NO. 13047-90001
MICROFICHE PART NO. 13047-90002

Printed: MAR 1975
Printed in U.S.A.

INTRODUCTION

The manual provides installation and service information for the HP 13047A User Control Store Kit, which is an accessory for the HP 21MX Computer Series. Additional information is provided in the following manuals:

a. *HP 21MX Computer Series Reference Manual,* part no. 02108-90002.

b. *HP 21MX Computer Series Installation and Service Manual,* part no. 02108-90006.

c. *Microprogramming 21MX Computers Operating and Reference Manual,* part no. 02108-90008.

d. *HP 12909B pROM Writer Operating and Reference Manual,* part no. 12909-90009.

DESCRIPTION

The user control store board (part no. 13047-60001) is designed for installation in the HP 21MX processor I/O PCA cage and interfaces with the CPU by means of a 50-conductor ribbon cable assembly (part no. 5060-8393). This board includes 48 integrated-circuit (IC) sockets to accommodate eight modules of control store, each of which requires six read-only-memory (ROM) IC's that have been tested, burned, and verified according to the user's need or supplied as an optional firmware package.

The 4,096 words of addressable ROM are divided into sixteen 256-word modules designated as module 0 through 15. Modules 0, 1, 14, and 15 hold the HP 21MX instruction set and are not available to the user microprogrammer. Modules 12 and 13 are reserved exclusively for user microprograms. Any other control store space not filled by Hewlett-Packard firmware options is available to the user microprogrammer. Figure 1 summarizes the allocation of control store.

INSTALLATION

POWER CONSIDERATIONS

The +5V power required by the user control store (UCS) board is obtained from the processor I/O backplane. One module of control store (six ROM IC's) sinks 2.5 amperes of current and each additional module installed sinks 980 milliamperes. Calculate the total current required by the UCS board and all other printed-circuit assemblies (PCA's) resident in the processor I/O PCA cage. If the total current requirement is greater than the +5V supply capability, then one or more interface PCA's must be removed and installed in an HP 12979A I/O Extender.

Note: The processor I/O current availability is given in table 1-1 in the *HP 21MX Computer Series Reference Manual.*

INTERRUPT CONSIDERATIONS

The UCS board includes a priority jumper circuit to maintain proper operation of the priority interrupt chain.

INSTALLATION PROCEDURE

Figure 2 identifies each control store module, its associated ROM IC sockets, and module select switch. The outlined area in figure 2 (module A) is typical of the eight modules that can be accommodated. Notice that IC socket XU21 is reserved for ROM bits 3:0, XU31 is reserved for ROM bits 7:4 . . . . . , and XU71 is reserved for ROM bits 23:20.

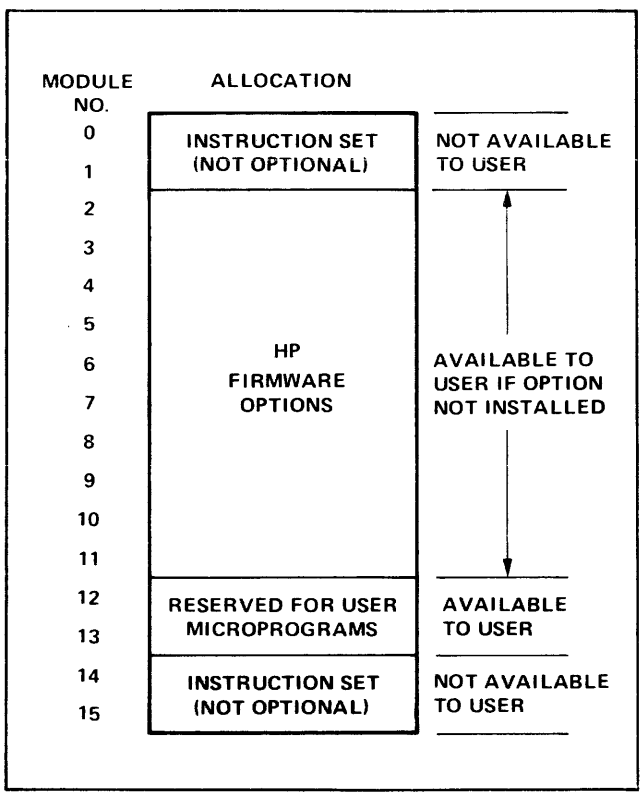

Figure 1. Control Store Module Allocation

Switch S1 is set as specified in table 1 to select the desired control store module address. Care should be taken to ensure that none of the UCS control store modules share the same module address as a module of the HP 12978A Writable Control Store (WCS) or a module of control store mounted to the CPU. For example, whenever *any* module assigned to the UCS is addressed, a comparator circuit pulls the Enable ROM External (ENRMX) line low and disables all other (external) control store modules.

To install the UCS board, proceed as follows:

a. On UCS board, load six ROM IC's into one of the eight module areas (A through H in figure 2). Ensure that the ROM IC's are oriented with the notched ends facing toward connector P1.

b. Assign a module number to this ROM module and set associated module address switch as specified in table 1.

c. Repeat steps a and b for each control store module to be installed.

Note: The module select switch of each *unloaded* UCS module *must* be set to select a *non-existent module* of control store to prevent the disabling feature described in the preceding paragraph. To assign a non-existent module address, set associated module select switch position 5, 6, or 7 to a logical 1 (closed position).

WARNING

Hazardous voltages are present inside the processor mainframe!! Before installing the user control store board, set the ~LINE and BATTERY switches to off and DISCONNECT THE POWER CORD!! Failure to observe this precaution can result in serious injury or DEATH!!

d. Set ~ LINE and BATTERY switches to OFF and disconnect the power cord.

e. Disconnect I/O extender cable assembly (if present) from CPU PCA edge connector J3.

f. Loosen screw located in rear fold of bottom cover; slide cover toward rear and remove.

g. Remove existing connector assembly from CPU PCA and ROM PCA A7. (See figure 3.)

h. Disconnect battery cable (if present) from BAT. INPUT connector and remove I/O PCA cage cover.

i. Pass UCS cable asembly (part no. 5060-8393) through opening in chassis below I/O PCA cage.

j. Connect cable assembly to ROM PCA A7 and CPU PCA. Reconnect I/O extender cable assembly (if present) to CPU PCA edge connector J3.

k. Replace processor bottom cover.

Table 1. Module Select Switch Settings

1	2	3	4	5	6	7	MODULE NO.
2^0	2^1	2^2	2^3	2^4	2^5	2^6	
0	0	0	0				0
1	0	0	0				1
0	1	0	0				2
1	1	0	0				3
0	0	1	0				4
1	0	1	0				5
0	1	1	0				6
1	1	1	0	Note 2			7
0	0	0	1				8
1	0	0	1				9
0	1	0	1				10
1	1	0	1				11
0	0	1	1				12
1	0	1	1				13
0	1	1	1				14
1	1	1	1				15

Notes:
1. OPEN position = logic 0
   Closed position = logic 1
2. Switch positions 5, 6, and 7 not used on 21MX. These switches must be OPEN to prevent addressing nonexistent modules of control store.

l. Install UCS board in I/O PCA cage slot 10, 11, or 12 depending on whether or not a WCS PCA(s) is present.

Note: If no WCS PCA is present, install UCS board in slot 10. If one WCS PCA is present, install UCS board in slot 11. If two WCS PCA's are present, install UCS board in slot 12.

m. Using a sharp knife or a pair of scissors, remove unused connector(s) from end of UCS cable assembly. Connect cable assembly to UCS board connector J1 and to WCS PCA(s) if present.

n. Replace I/O PCA cage cover and reconnect battery cable (if present) to BAT.INPUT connector.

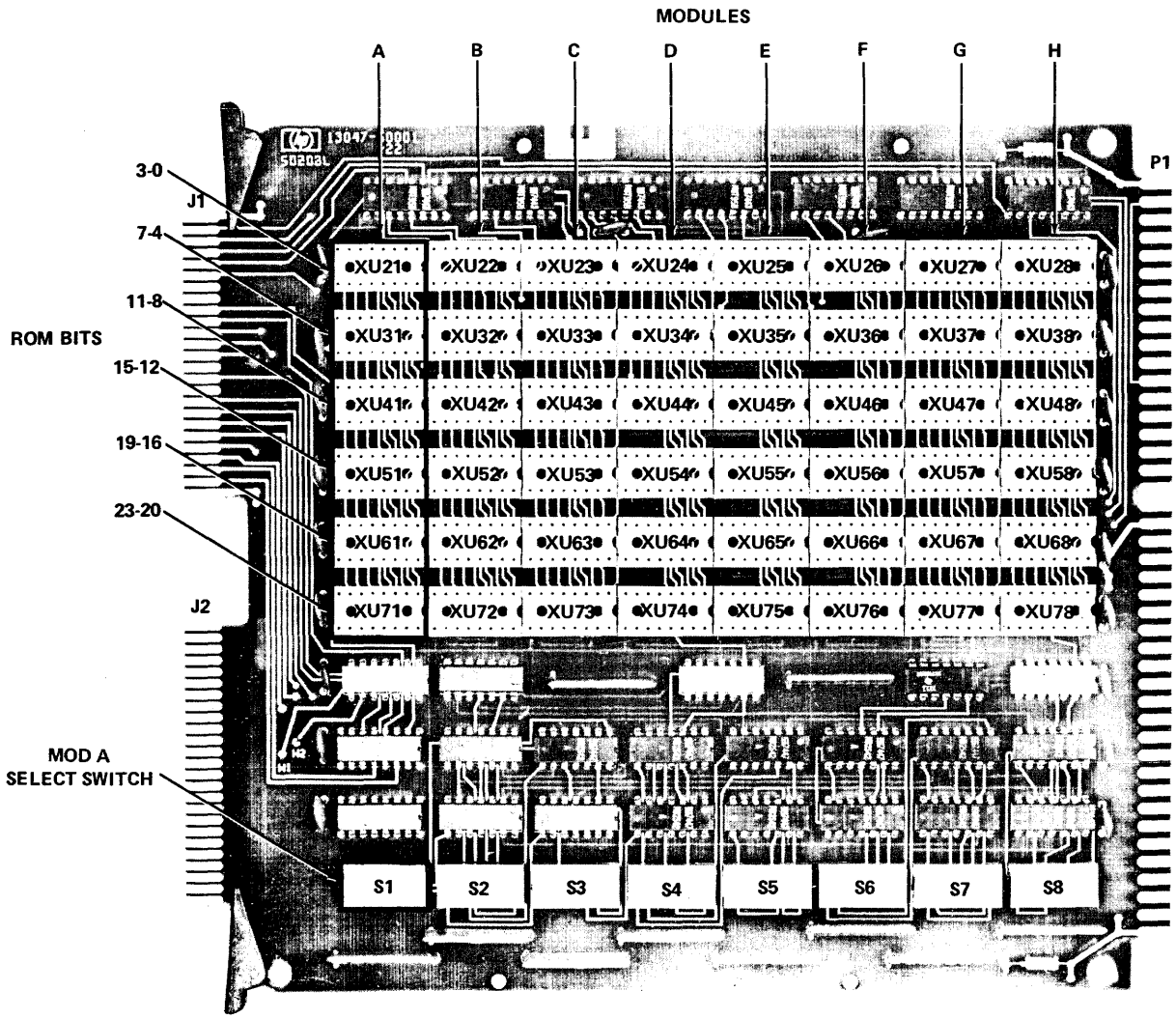

Figure 2. User Control Store Module Space

o. Plug processor power cord into power mains receptacle and set ~ LINE and BATTERY switches to ON.

p. On processor operator panel, rotate key-operated switch to R (reset) and then to OPERATE.

The installation is now complete and ready for the user's or optional microprogramming application.

SERVICE INFORMATION

Figure 4 identifies and provides the location of replaceable parts for the user control store board and figure 5 is the schematic diagram. Replaceable parts information and a list of manufacturers are provided in tables 2 and 3, respectively. A list of HP Sales and Service Offices is provided in the *HP 21MX Computer Series Installation and Service Manual.*

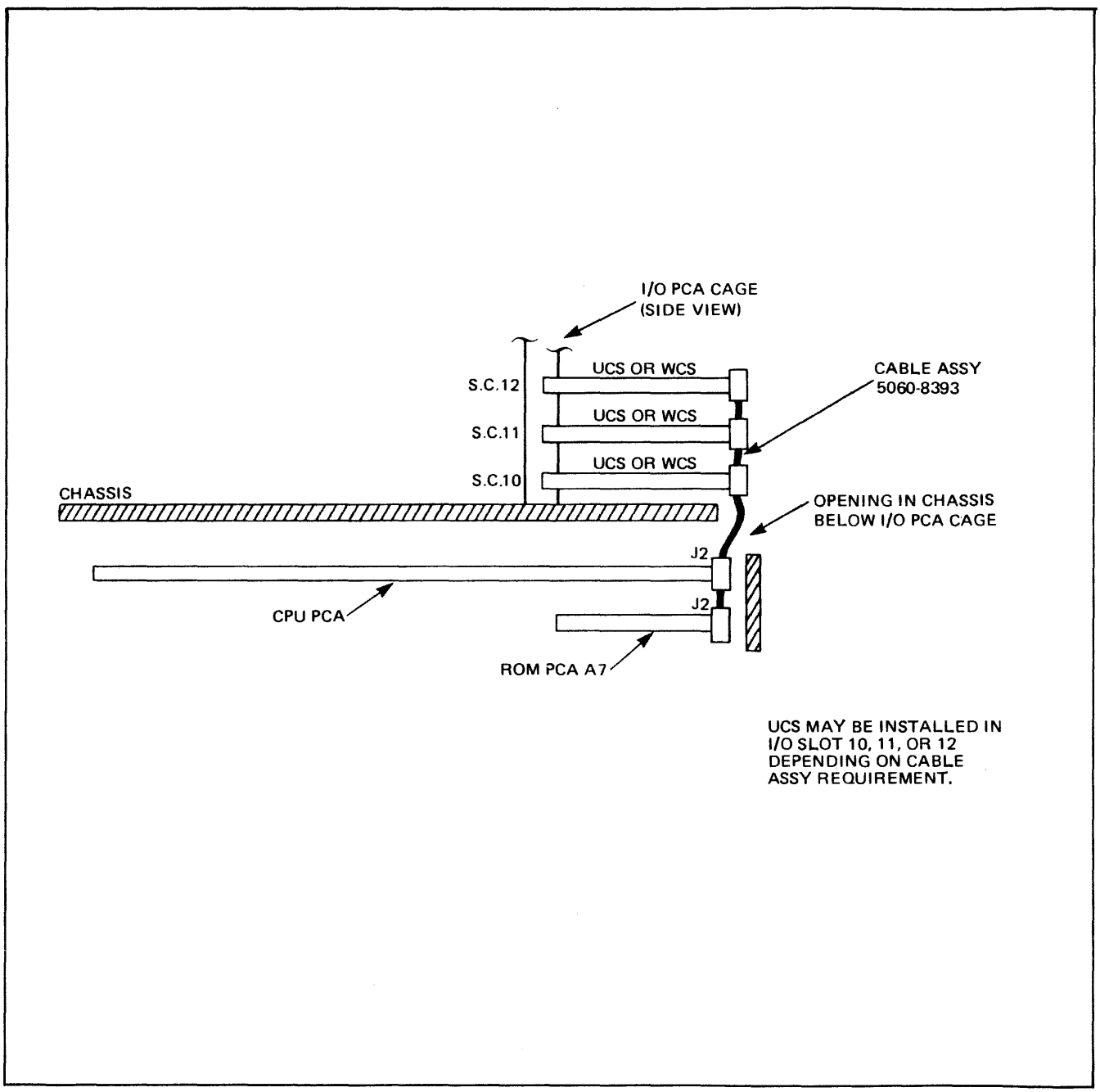

Figure 3. Installation Details

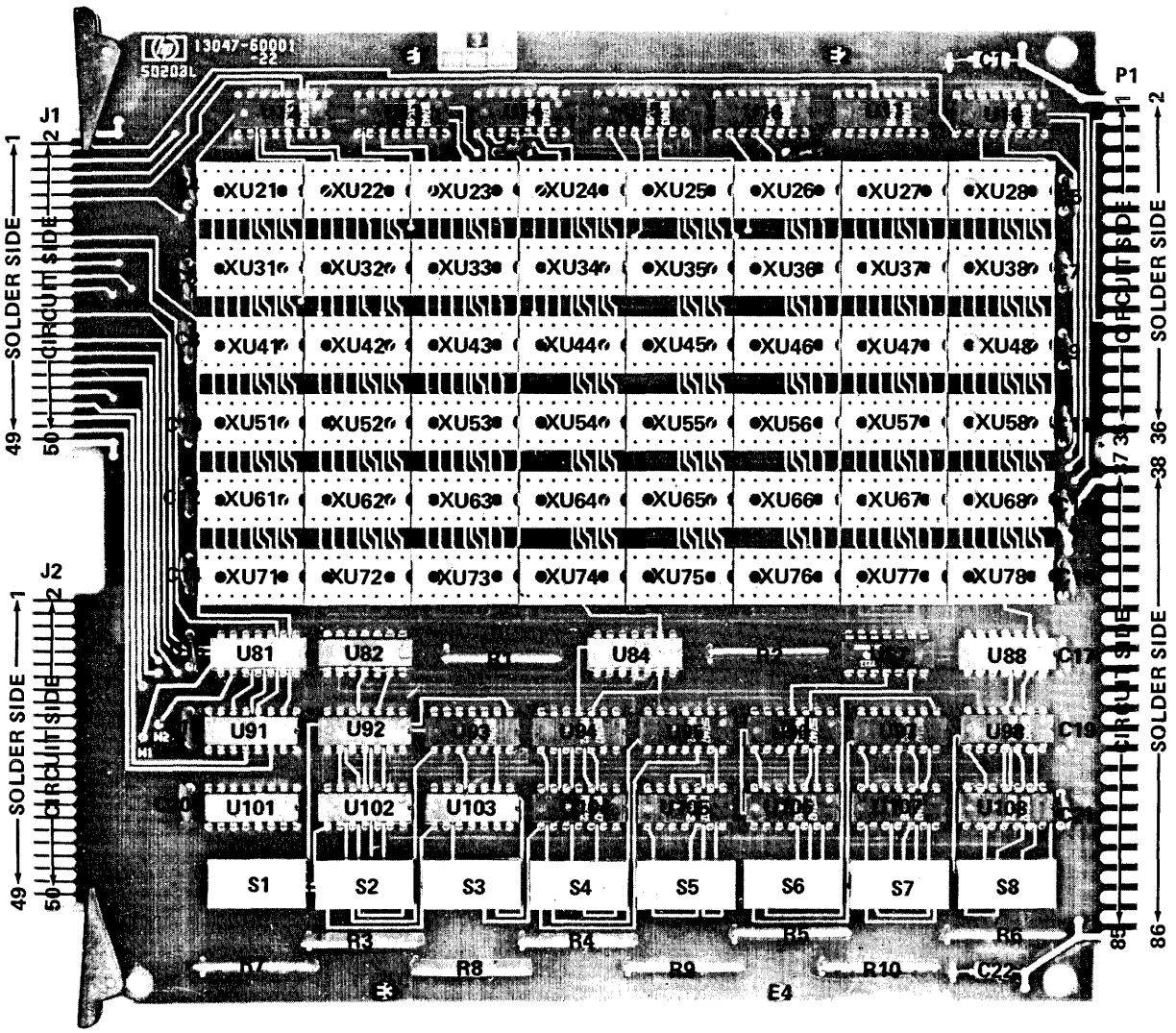

Figure 4. User Control Store Board Parts Location

Table 2. User Control Store Board Replaceable Parts

REFERENCE DESIGNATION	HP STOCK NO.	DESCRIPTION	MFR CODE	MFR PART NO.
C1,22	0180-0197	Capacitor, Fxd, Elect, 2.2 μF ±10%,20 VDCW	56289	150D225X9020A2-DYS
C2 thru 21	0160-2055	Capacitor, Fxd, Cer, 0.01 μF, +80 −20%, 100 VDCW	56289	C023F101F103ZS22-CDH
R1 thru 10	1810-0125	Resistor, 7 x 4.7K ohms, ±5%	56289	200C-1858-CRR
S1 thru 8	3101-1974	Switch assembly, 7-pole, 2-position	81073	76B07
U12 thru 18	1820-1477	Integrated Circuit, 6-bit driver (non-inverting), 3-state, TTL	18324	8T95
U81	1820-0681	Integrated Circuit, Quad 2-input NAND gate, TTL	01295	SN74S00N
U82, 87	1820-0684	Integrated Circuit, Hex inverter, open collector, TTL	01295	SN74S05N
U84, 88	1820-0683	Integrated Circuit, Hex inverter, TTL	01295	SN74S04N
U91, 101	1820-1476	Integrated Circuit, 6-bit driver (inverting), 3-state, TTL	18324	8T96
U92 thru 98, 102 thru 108	1820-1073	Integrated Circuit, Quad 2-input exclusive-OR gate, TTL	18324	82S42
XU21 thru 28, 31 thru 38, 41 thru 48, 51 thru 58, 61 thru 68, 71 thru 78	1200-0482	Socket, Integrated Circuit, 16-pin	91506	S16-AG10D

Table 3. Code List of Manufacturers

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 and H4-2, and the latest supplements.

CODE NO.	MANUFACTURER	ADDRESS
01295	Texas Instruments, Inc., Semiconductor Components Division	Dallas, Texas
18324	Signetics Corp.	Sunnyvale, Cal.
28480	Hewlett-Packard Co.	Palo Alto, Cal.
56289	Sprague Electric Co.	North Adams, Mass.
81073	Grayhill Inc.	La Grange, Ill.
91506	Augat Inc.	Attleboro, Mass.

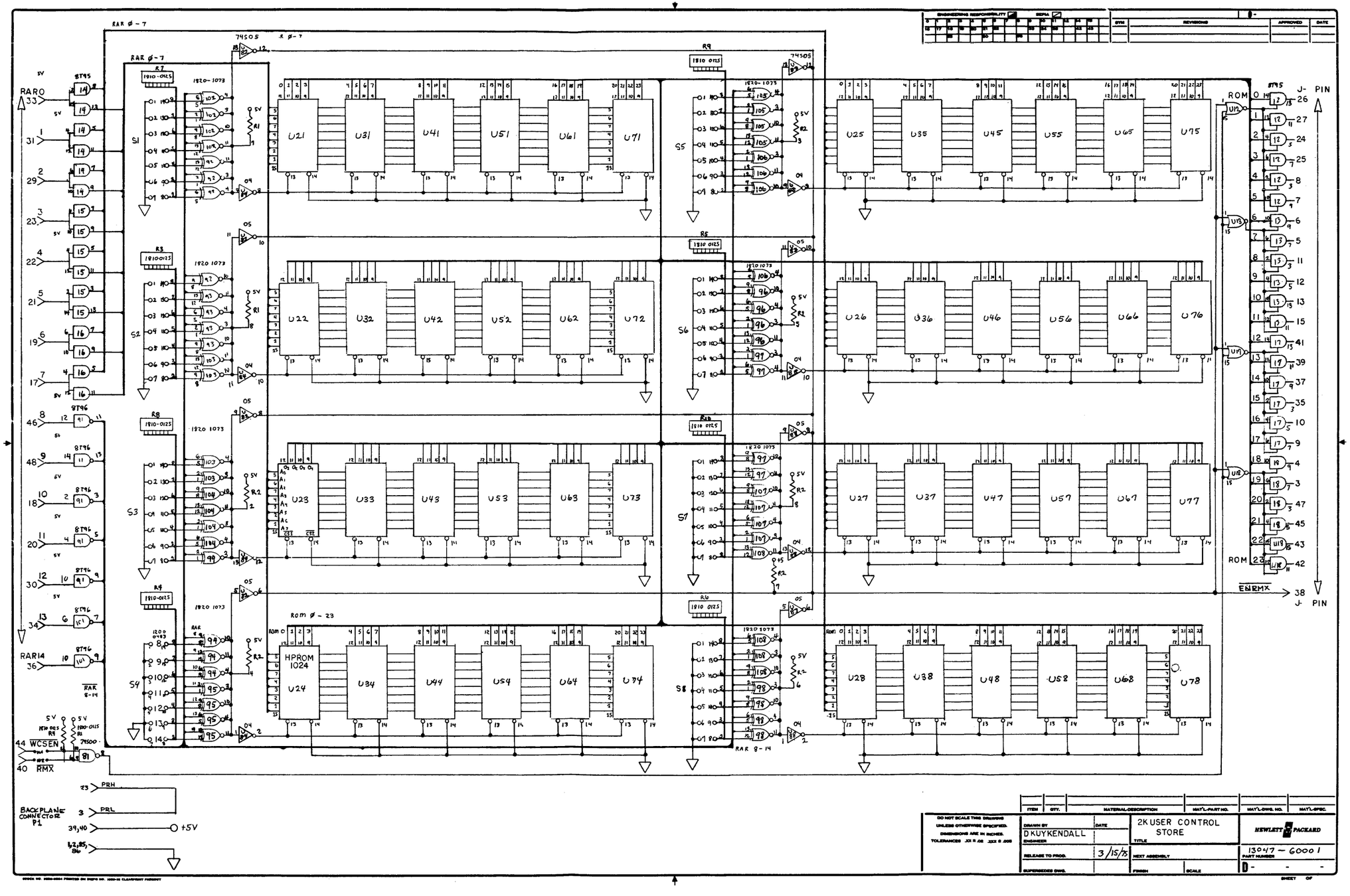

Figure 5. User Control Store Board Schematic Diagram